magnitude but opposite polarity). A circuit is responsive to the sensors for comparing the signals produced by the sensors. The comparison may be performed in real time.

[0012] According to another embodiment of the disclosure, a MEMS device comprises a plurality of fixed beams arranged symmetrically and a plurality of movable beams arranged symmetrically. A first sensor is formed by certain of the fixed and movable beams while a second sensor is formed by at least certain other of the fixed and movable beams. The first and second sensors are symmetrically located within the MEMS device. A circuit is responsive to the first and second sensors for comparing signals produced by the first and second sensors. The comparison may be performed in real time.

[0013] The present disclosure is also directed to a method comprising actuating a MEMS device and comparing the outputs from a first and a second sensor, each electrically isolated from one another and positioned to produce signals of substantially identical characteristics. The sensors may be symmetrically located and the method may be carried out in real time.

[0014] A combination of existing layout features and additional circuitry is used to make measurements from various points in a MEMS. In addition to the normal sense output, self-test outputs are used to detect the presence of layout asymmetry that are caused by local, hard-to-detect defects. Simulation results for an accelerometer reveal that the disclosed approach is able to distinguish misbehavior resulting from local defects and manufacturing process variations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] For the present disclosure to be easily understood and readily practice, the disclosure will now be described, for purposes of illustration and not limitation, in conjunction with the following figures where:

[0016] FIGs. 1A – 1F illustrate various examples of symmetric MEMS devices such as (A) microresonator, (B) accelerometer, (C) gyroscope, (D) array of RF-MEMS switches in an antenna, (E) micromotor, and (F) ink-jet print head microsystem with 50 nozzles;

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[0017] FIG. 2 is a simplified top view of an accelerometer's mechanical microstructure;

[0018] FIG. 3 is a table illustrating microstructure voltage biasing for normal and self-test operations;

[0019] FIG. 4 is a schematic of a differential amplifier;